



### Main applications

- Metal heat treating furnaces
- Vacuum furnaces with graphite elements
- High-temperature furnaces
- Boosters for glass lines
- Quick cutting on blow molding lines
- Machines and lines with unwanted current peaks and arcs
- "Fuse-free" solutions

### Main features

- Suitable for use in a wide range of applications including furnaces for heat-treatment, high temperature material-sintering processes, glass and ceramic production
- The integrated overcurrent fault protection provides complete heating process and system protection
- Designed for Super Kanthal™ and silicon carbide single or three-phase heating systems
- Operating current and voltage range up to 60 A , 480Vac.
- Configurable in all control firing modes including zero crossing, half-single cycle and phase angle
- Wide range of options to suit specific applications including transformer based heating systems
- Modbus RTU serial connection

### PROFILE

The Gefran GTF-Xtra power controller combines the functionality of a single, two or three phase solid-state power unit and controller with the benefits of the unique integrated overcurrent fault protection function.

The fault protection eliminates the need for extra-rapid fuses, reducing machine downtime and the cost of replacing fuse failures. It does so by instantaneously monitoring load current, cutting the power if the load reaches a pre-set threshold and isolating the power switching devices.

In applications susceptible to intermittent short-circuits and overloads, the Gefran Xtra power controller can be programmed to restore power automatically when the fault has cleared, preventing complete process shutdown and maintaining production.

Alternatively, power can be manually re-stored, locally or remotely.

A soft-start ramp is applied when the current is restored, to prevent system damage in the event that the fault is not effectively cleared.

The GTF-Xtra controller is compact, modular and optimised to control virtually any type of resistive heating system in a wide range of industrial applications.

Impressive functionality is assured by a comprehensive array of options that are configurable with intuitive, guided-set-up, PC-based Windows™ software.

GTF-Xtra always provides an RS485 serial connection with Modbus RTU protocol to control currents, voltages, powers, load status, and device status from the supervisor terminal (HMI) or PLC

#### Installation notes:

- To ensure maximum reliability, it is essential to install the unit correctly in the panel in order to guarantee adequate heat exchange between the heat sink and the room under natural convection conditions.
- Install the unit vertically (max 10° inclination from vertical axis).
- Vertical distance between unit and panel wall >100mm

- Applications with solid state power units must also include an automatic safety switch to cut out the load power line.

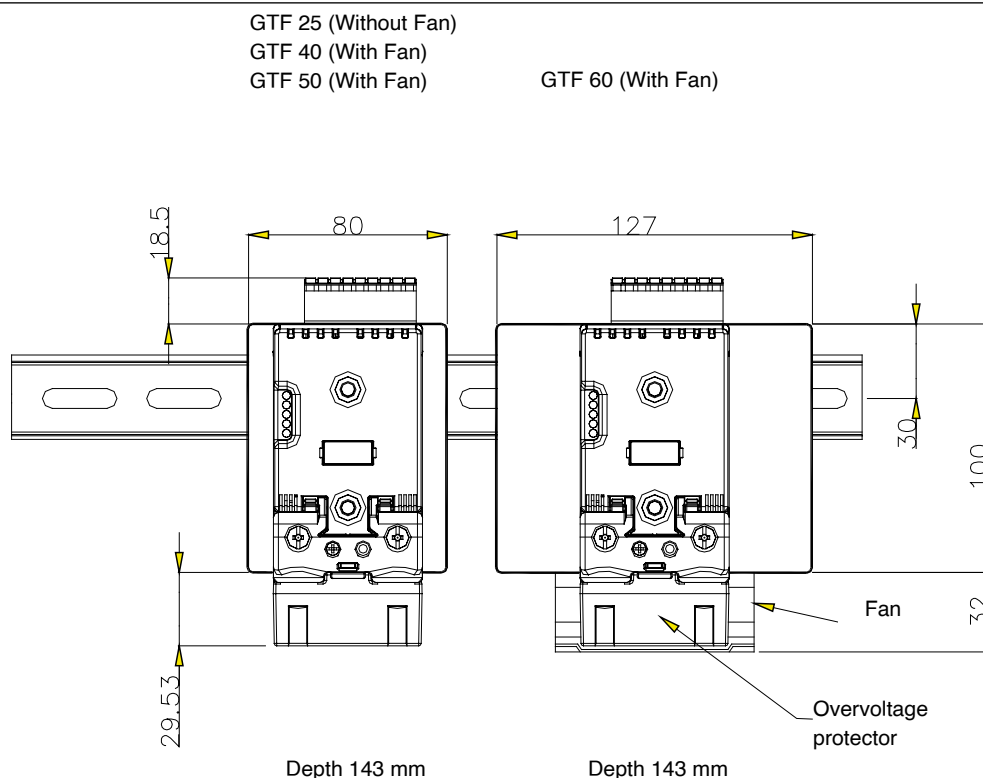
#### Overcurrent fault protection

This function eliminates the need for an external extra-rapid fuse to protect the device.

In case of load short-circuit, the internal IGBT device is instantaneously switched off and the alarm status is signaled.

**It's necessary to install the voltage stabilizer enclosed with the product (see Installation section).**

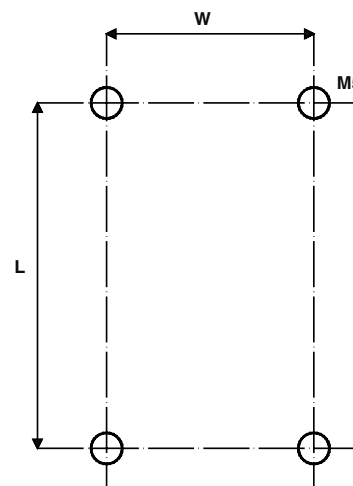
## DIMENSIONS



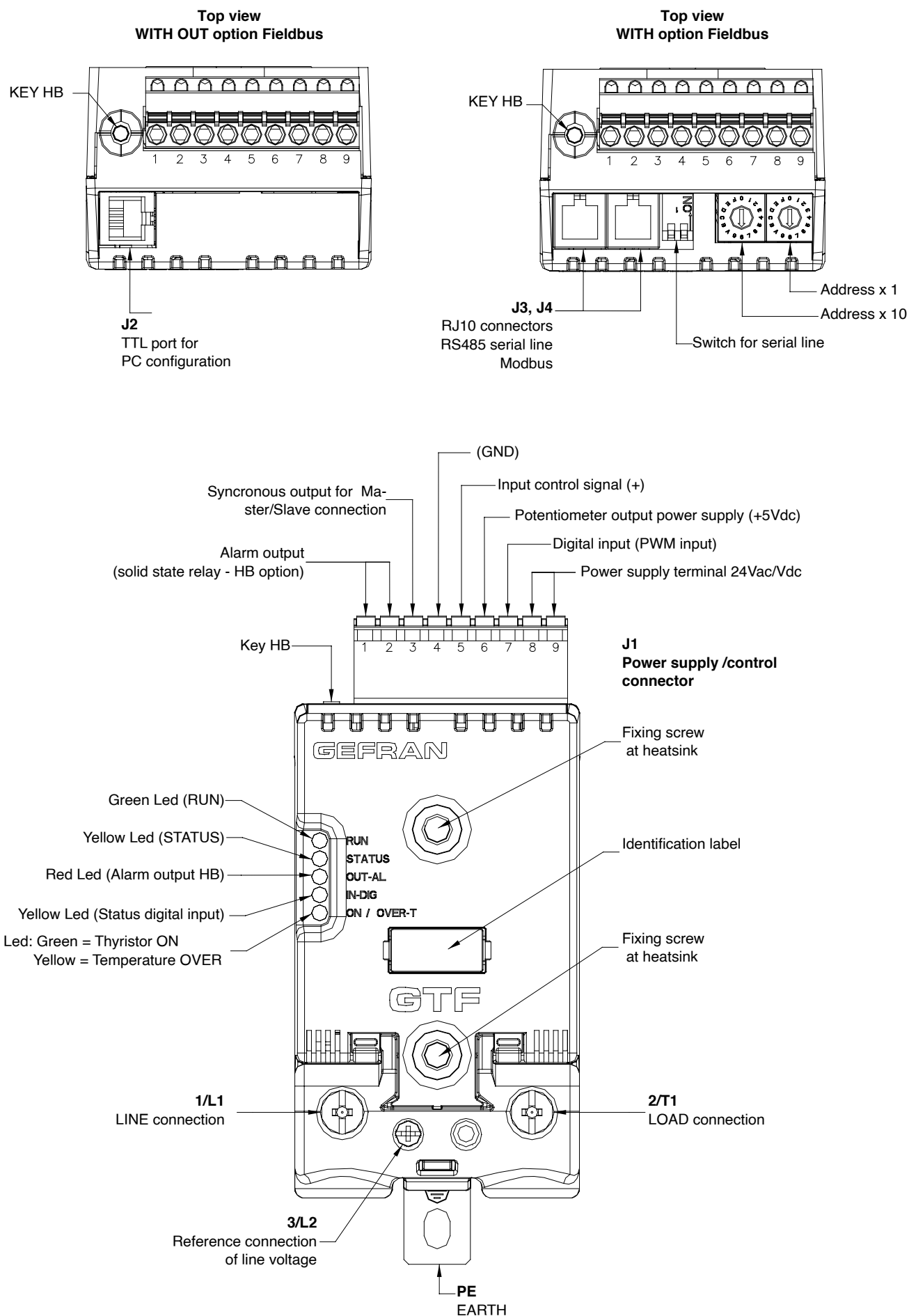
Fastening may be done on DIN guide (EN50022) or with (5MA).  
All dimensions are expressed in mm.

## TEMPLATE DIMENSIONS

	L (mm)	W(mm)
<b>Models</b>		
GTF 25-40-50A:	112	44
GTF 60A:	112	113



# DESCRIPTION OF CONNECTIONS GTF 25-60A



# FUNCTION MODE

## Trigger modes

The GTF provides the following power control modes:

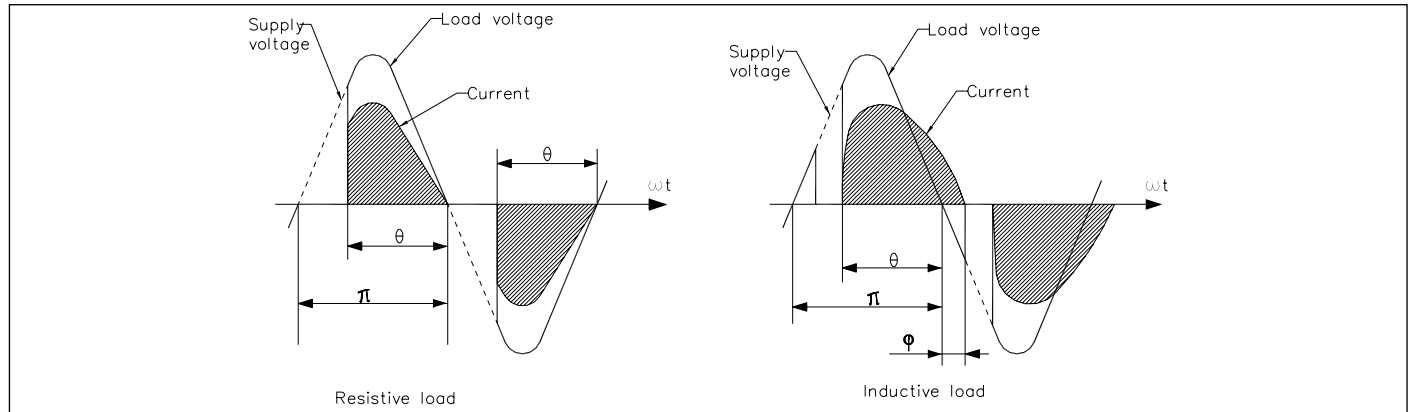
- modulation via variation of phase angle: PA modality
- modulation via variation of number of conduction cycles with "zero crossing" trigger": ZC, BF, HSC modality.

## PA - Phase angle

This mode manages power on the load by modulating load phase angle (only mono-phase)

ex: if power to be transferred to the load is 100%,  $\theta = 180^\circ$

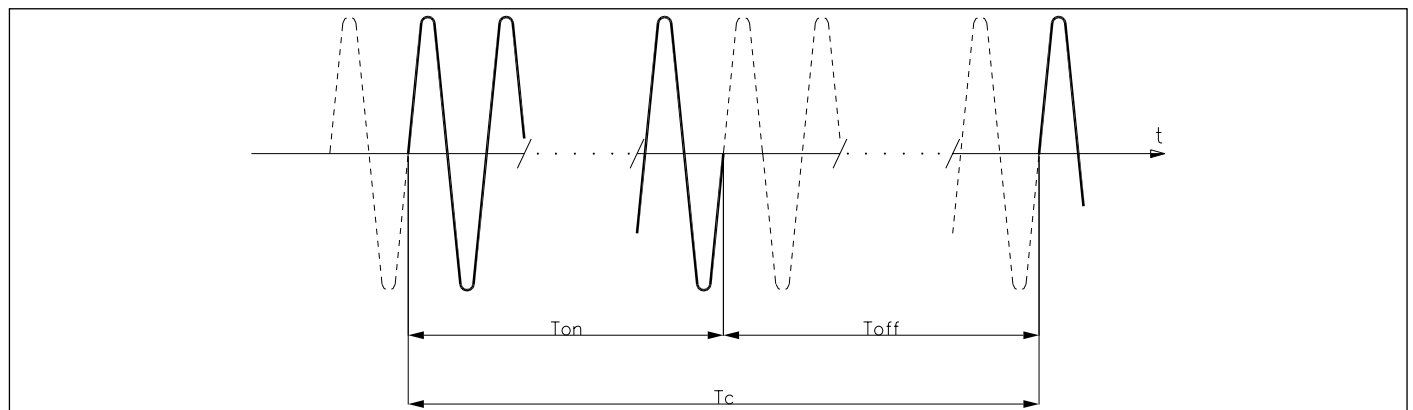
ex: if power to be transferred to the load is 50%,  $\theta = 90^\circ$



## Zero Crossing mode

This function eliminates EMC noise. This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.

**ZC** - Zero Crossing constant cycle time ( $T_c \geq 1$  sec, settable from 1 to 200 sec) Cycle time is divided into a series of conduction and non conduction cycles in proportion to the power value to be transferred to the load. (mono-phase or bi-phase).

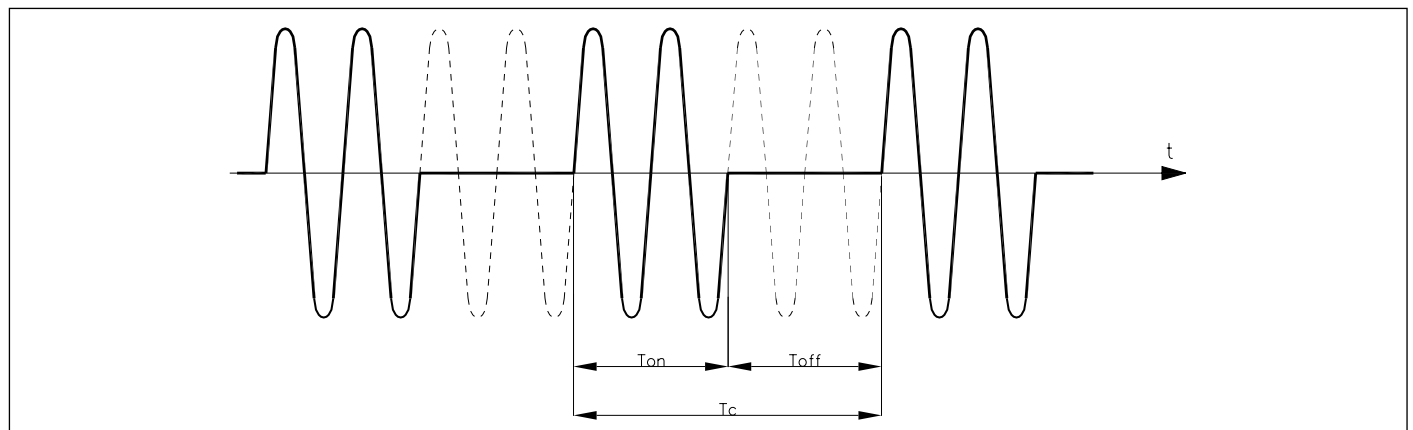


For example, if  $T_c = 10$ sec, if the power value is 20% there is conduction for 2 sec (100 conduction cycles @ 50Hz) and non conduction for 8 sec (400 non conduction cycles @ 50Hz).

**BF** - Burst Firing, Zero Crossing variable cycle time (mono-phase or bi-phase).

This mode controls power on the load via a series of conduction ON and non conduction OFF cycles. The ratio of the number of ON cycles to OFF cycles is proportional to the power value to be supplied to the load.

The CT repeat period is kept to a minimum for each power value (whereas in ZC mode the period is always fixed and not optimized).



Example of operation in BF mode with power at 50%. A parameter defines the minimum number of conduction cycles settable (from 1 to 10). In the example, this parameter = 2.

## FUNCTION MODE

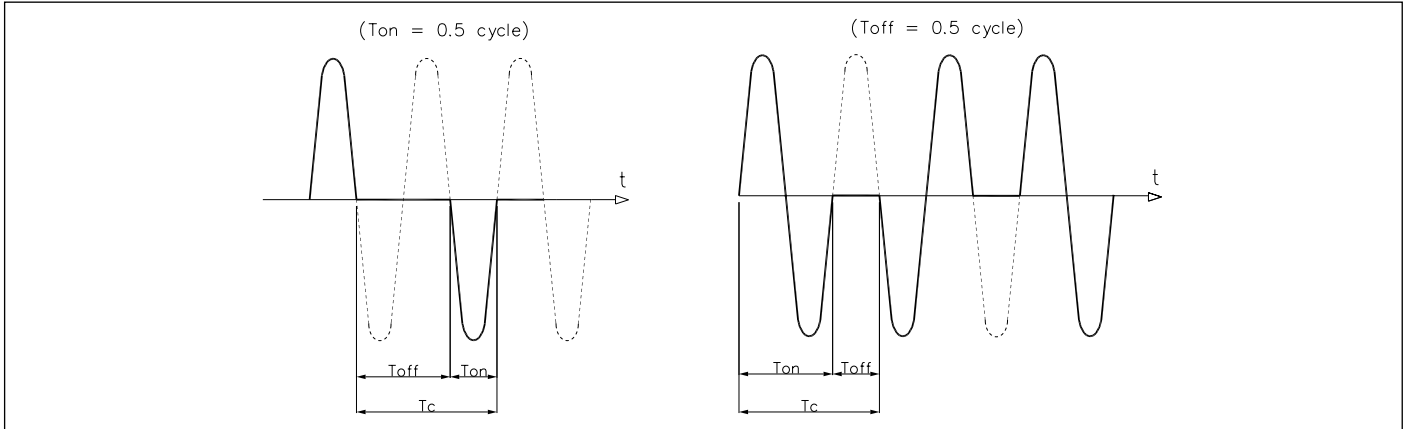
### HSC - Half single cycle

This mode corresponds to Burst Firing that manages ON and OFF half-cycles.

It is useful for reducing the flickering of filaments with short/medium-wave IR lamp loads. With these loads, to limit operating current with low power, it is useful to set a minimum power limit (for example,  $Lo.p = 10\%$ ).



NB: This mode is NOT allowed with inductive loads (transformers). It is used with resistive loads in single-phase, star with neutral, or open delta configuration.



Example of operation in HSC mode with power at 33 and 66%.

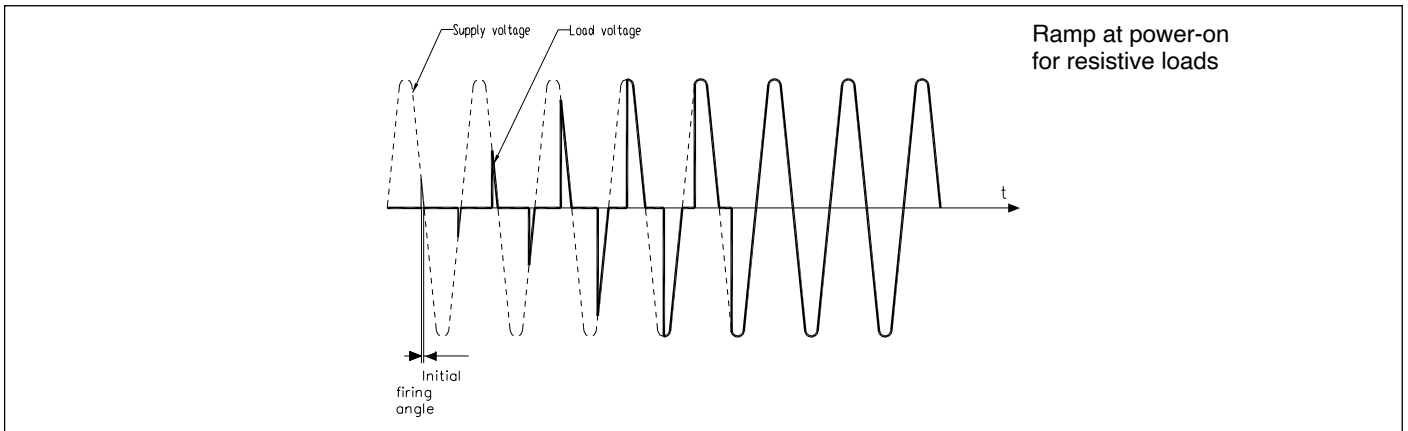
### Softstart or Ramp at power-on

This type of start can be enabled in either phase control or pulse train mode, mon-phase.

With phase control, the increment of firing angle stops at the corresponding power value to be transferred to the load.

The control of maximum current spike can be enabled during the ramp phase (this is useful in case of short circuit on the load or loads with other temperature coefficients to automatically adjust the start time of the load).

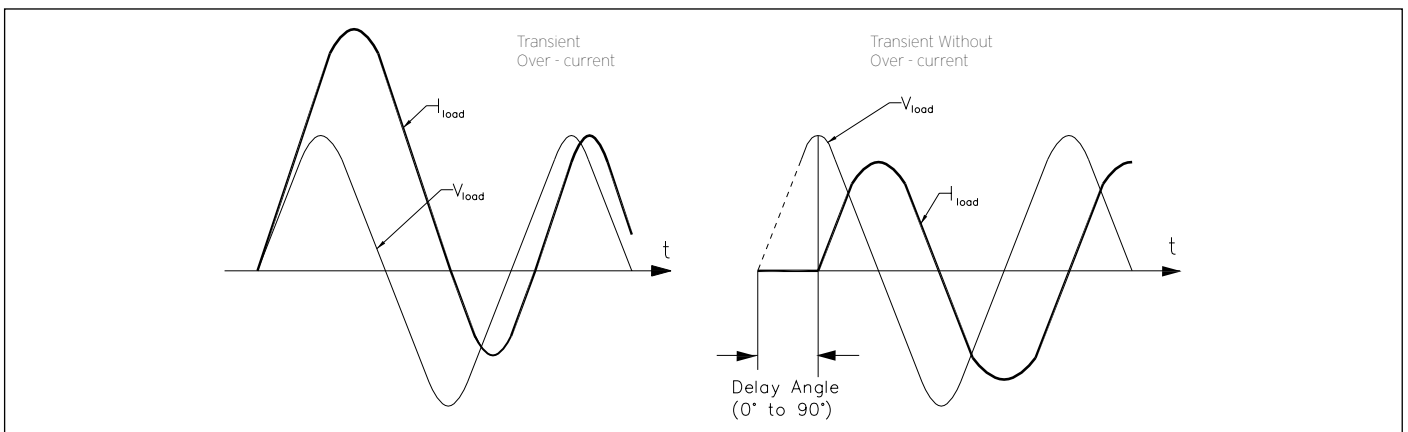
The ramp is automatically re-enabled if the GTF remains off for a (settable) time



### DT - Delay triggering" of first cycle (only for control modes ZC, BF mon-phase)

Settable from  $0^\circ$  to  $90^\circ$ .

Useful for inductive loads (transformer primaries) to prevent current spike that could in certain cases trip the high-speed fuses that protect the SCRs.



## TECHNICAL DATA

### General features

Category of use: AC51, AC55b, AC56a

### Load type:

**AC51** resistive or low-inductance loads  
**AC55b** short wave infrared lamp (SWIR)  
**AC56a** transformers,  
(Request application check)

### Switch-on modes:

**ZC** Zero crossing constant cycle time  
(1-200sec)  
**BF** Burst Firing variable cycle time  
(GTT) minimum or optimized  
**HSC** Half Single Cycle corresponds to  
Burst Firing that manages  
Semi-cycles of on and off.  
Useful to reduce flickering with  
short-wave infrared loads  
**PA** Phase Angle

### Nominal voltage:

480Vac (max range 90-530Vac)  
Nominal frequency: 50-60Hz

**Non-repetitive voltage:** 1200Vpk

### Control analog input

Voltage: 0...5Vdc, 0...10Vdc  
(impedance >100K $\Omega$ )  
Current: 0...20mA, 4...20mA  
(impedance 125 $\Omega$ )  
Potentiometer: from 1k $\Omega$  to 10k  $\Omega$   
(auto-fed by 5V by GTF)

### Digital inputs

Range 5-30V max 7mA  
PWM input control: max 100Hz  
(Configurable Features).

### Voltage line range:

Range: 90... V\_nominal\_product  
Frequency: 50-60Hz  
Accuracy: 2% f.s

### Current load range:

Range: 0... 2\* I\_nominal\_product  
Accuracy: 3% f.s  
Sampling 0,2 msec

### HB alarm output

The HB function detects partial or total load interruption.  
The control measures load current by means of an internal device.  
The current limit value is set via an automatic procedure activated with the HB button located near the upper connector.

The alarm output is obtained by means of a solid relay, with normally open contact (max 30V, 150mA, maximum conduction resistance 15 $\Omega$ ).

### Modbus RS485 serial (optional)

This option lets you connect the device to a PC, PLC, HMI with a simple RJ10 telephone wire, by using an RS485 serial line with Modbus protocol.

The Baud-Rate is configurable from 1200 Baud to 19200 Baud.

A pair of rotary-switches lets you quickly assign the node address.

A dip-switch near the rotary-switches lets you internally insert the line termination resistance.

Isolation 300V

### OUTPUTS

#### IsolationHV

Rated isolation voltage input/output: 4000Vac

#### Thermic Dissipation:

GTF models dissipate thermic power based on load current:

$$P_{\text{dissipation}} = I_{\text{load\_Arms}} * 2.8V \text{ (W)};$$

#### Overcurrent Fault Protection

These function eliminates the need for an external extra-rapid fuse to protect the device.

In case of load short-circuit, the internal device is instantaneously switched off and the alarm status is signaled.

#### Condition of employment:

- Switching capacity: 5KA - 480V
- Inductance max system: 500uH

### LED

N.5 LEDs indicator:

RUN (green)  
STATUS (yellow)  
ALARM (red)  
DIGITAL INPUT (yellow)  
ON / OVER-TEMP. (green / yellow)

### Power supply (model GTF 25-60A)

24Vdc/Vac +/-25%  
Input @ 25Vdc: max 100mA  
Power: max 3VA  
Maximum voltage insulation from control signals: 300 V

### Fan power supply

24Vdc +/-10%  
Current draw @ 25Vdc: max 200mA

### Ambient conditions:

Working temperature: 0-50°C (see the de-rating curve)  
Storage temperature: -20°C - +70°C Max.  
relative humidity: 85% not condensing  
Max. installation altitude: 2000m slm  
Pollution level: 2

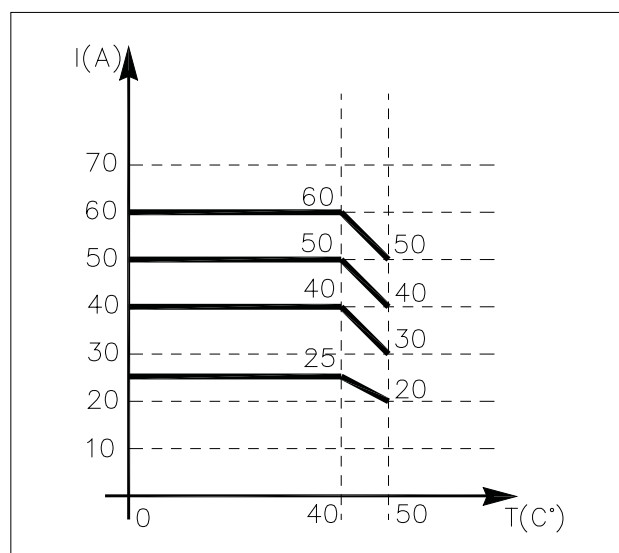
### Installation

bar DIN EN50022  
Dimensions: see dimensions and installation

### Weight

GTF 25	0,97 Kg
GTF 40/50	1,1 Kg
GTF 60	1,5 Kg

## DERATING CURVES





# ELECTRICAL CONNECTION

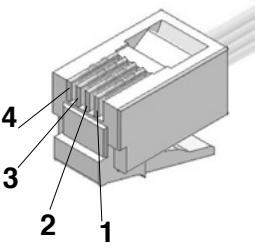
## POWER CONNECTION

### RECOMMENDED WIRE GAUGES

GTF CURRENT LEVEL	TERMINAL	CABLE WIRE	WIRE TERMINAL	TIGHTENING TORQUE / TOOL
25A	1/L1, 2/T1, PE	4 mm <sup>2</sup> 10 AWG	Wire terminal / Eye D. 6mm	2.5 Nm / Phillips screwdriver PH2 - PH3
40A	1/L1, 2/T1, PE	10 mm <sup>2</sup> 7 AWG	Wire terminal / Eye D. 6mm	2.5 Nm / Phillips screwdriver PH2 - PH3
50A	1/L1, 2/T1, PE	10 mm <sup>2</sup> 7 AWG	Wire terminal / Eye D. 6mm	2.5 Nm / Phillips screwdriver PH2 - PH3
60A	1/L1, 2/T1, PE	16 mm <sup>2</sup> 5 AWG	Wire terminal / Eye D. 6mm	2.5 Nm / Phillips screwdriver PH2 - PH3
---	3/L2 (Ref. Vline)	0.25 ...2.5 mm <sup>2</sup> 23...14 AWG	Wire stripped for 8 mm or with tag terminal	0.5 ... 0.6 Nm / Flat-head screwdriver tip 0.6 x 3.5 mm
<b>Note:</b> Cables must be copper "Stranded Wire" or "Compact-Stranded Wire" type with maximum operating temperature 60/75°C				

### SIGNAL CABLE

GTF 25-60: J1		0,2 - 2,5mm <sup>2</sup>	24 - 14AWG
		0,25 - 2,5mm <sup>2</sup>	23 - 14AWG

RS 485	Connector RJ10 4-4 pin	Nr. Pin	Name	Description	Note
		1	GND1 (**)		(*) Insert the line termination in the last device on the Modbus line.  (**) Connect the GND signal among Modbus devices with a line distance > 100 m.
		2	Tx/Rx+	Data reception/transmission (A+)	
		3	Tx/Rx-	Data reception/transmission (B-)	
		4	+V (reserved)		
<b>Cable type:</b> flat telephone cable for pin 4-4 conductor 28AWG					

## ORDERING CODE

GTF -   480   1 2  

NOMINAL CURRENT	
25A	25
40A	40
50A	50
60A	60

FIELDBUS	
0	Absent
M	MODBUS RTU

CONTROL OPTIONS	
0	Absent
1	Current limit
2	Current limit and feedback V, I, P

**Note:** All models have 480VAC nominal voltage and are equipped with a partial/total load interrupt (HB) function)

Signal control (configurable)	
10V (Default)	1
5V/Potentiometer	2
0-20mA	3
4-20mA	4
PWM/Digital input	5

Trigger modes (configurable)	
ZC	Z
BF (Default)	B
HSC	H
PA	P

Function type (configurable)	
Master (Default)	M
Slave	S
Slave dual-phase	S2

*Note:*

*Configurator Standard 1-B-M, if not differently specified .*

*Substitution model:*

GTS **GTF - X - 480 - 0 - 0 - 0 - 0 - 5 - Z - S**

GTT *without load interrupted option*

**GTF - X - 480 - 0 - 0 - 0 - 0 - 1 - B - M**

GTT *with load interrupted option*

**GTF - X - 480 - 0 - 1 - 0 - 0 - 1 - B - M**

## ACCESSOIRES

### CONFIGURATION KIT

KIT PC USB / RS485 o TTL



kit for PC via the USB port (Windows environment) for GTF standard configuration (TTL port) for configuration of GTF with the RS485 option

Lets you read or write all of the parameters of a single GTF

A single software for all models

- Easy and rapid configuration
- Saving and management of parameter recipes
- On-line trend and saving of historical data

*Component Kit:*

- Connection cable PC USB <----> GTF port TTL
- Connection cable PC USB <----> GTF RS485 port
- Serial line converter
- CD SW GF Express installation

### ORDERING CODE

GF\_eXK-2-0-0.....Cod. F049095

*A wide range of accessories is available (including fuses and fuse holders, supports for fastening DIN bar, ID plates, thermostats, current transformers and isolation transformers). To choose accessories, see the section "Solid state relays - Accessories."*



## • WARNINGS



**WARNING:** this symbol indicates danger.

**Before installation, please read the following advices:**

- follow the indications of the manual scrupulously when making the connections to the instrument.
- use a cable that is suitable for the ratings of voltage and current indicated in the technical specifications.
- if the instrument is used in applications where there is risk of injury to persons and damage to machines or materials, it is essential that it is used with an auxiliary alarm device.

It is advisable to verify frequently that the alarm device is functional even during the normal operation of the equipment.

- The instrument must NOT be used in environments where there could be the presence of dangerous atmospheres (flammable or explosive).
- During continuous operation, the heatsink may reach 100°C and remain at a high temperature due to thermal inertia even after the device is switched off. Therefore, DO NOT touch the heat sink or the electrical wires.
- do not operate on the power circuit unless the main supply is disconnected.
- DO NOT open the cover if device is "ON"!

(use the holes in the cover for eventual re-calibration).

**Installatio:**

- connect the device to the ground using the proper ground terminal.
- the power supply wiring must be kept separate from that of inputs and outputs of the instrument; always check that the supply voltage corresponds to that indicated on the instrument cover.
- Delete this line entirely..
- keep away from dust, humidity, corrosive gases and heat sources.
- The connection cable must be shorter than 3 meters if the current transformer is used.

**Maintenance:** Check the correct operation of the cooling fans at regular intervals; clean the ventilation air filters of the installation at regular intervals.

- Repairs must be performed only by specialized or appropriately trained personnel. Cut off power to the device before accessing internal parts.
- Do not clean the box with solvents derived from hydrocarbons (trichloroethylene, gasoline, etc.). Using such solvents will compromise the mechanical reliability of the device. To clean external plastic parts, use a clean cloth wet with ethyl alcohol or water.

**Technical service:** GEFRA has a technical service department. Defects caused by use not conforming to the instructions are excluded from the warranty.

GEFRAN spa reserves the right to make any kind of design or functional modification at any moment without prior notice

**UL**

Conformity C/UL/US File no. E243386 vol. 1 sez. 5



This device conforms to European Union Directive 2004/108/CE e 2006/95/CE with reference to generic standards: EN 60947-4-3 (product) EN 61010-1 (safety)

**GEFRAN**

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